

### REMARKS

Claims 1-17 and 21 are all the claims pending in the application. Claims 1-17 stand rejected on prior art grounds. Claims 18-20 have been canceled and claim 21 has been added. Applicants respectfully traverse these rejections based on the following discussion.

#### **I. The 35 U.S.C. §112, Second Paragraph, Rejection**

Claims 7 and 17 stand rejected under 35 U.S.C. §112, second paragraph. The claims have been amended, above, to overcome this rejection. Specifically, claim 7 has been rejected because the Office Action asserts that the percentage defined in claim 7 is unclear because the units of the percentage are not defined. Accordingly, Applicants have amended claim 7 to include that "said abrupt change comprises a drop in peak-to-peak voltage of greater than 5%", thus clearly defining the units of percentage.

In addition, claim 17 has been rejected because the Office Action asserts that the step of correlating in claim 17 is indefinite because the physical process step is not defined. As such, Applicants have amended claim 17 to include the steps of "maintaining a history of power levels associated with an onset of plasma leakage for each type of defect; measuring a power level at which said abrupt drop in peak-to-peak voltage occurred; and correlating said power level with a specific type of chamber defect maintained in said history." Thus, the physical process steps of claim 17 have been clearly defined.

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In view of the foregoing, the Examiner the use respectfully requested to reconsider and withdraw these rejections.

## **II. The Prior Art Rejections**

Claims 1, 4-6, 8, 12, and 14 stand rejected under 35 U.S.C. §102(e) as being anticipated by Chen, et al. (U.S. Publication No. 2004/0116080), hereinafter referred to as Chen. Claims 2-3, 11, and 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Chen. Claims 7 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Chen, in view of Angra, et al (Pramana – journal of Physics, Vol., 54 No. 5, May 2000, pp. 763-769: Unstable Plasma Characteristics in Mirror Field Electron Cyclotron Resonance, Microwave Ion Source), hereinafter referred to as Angra. Claim 9 stands rejected under 35 U.S.C. §103(a) as being obvious over Chen, in view of Manabu, et al. (JP Patent No. 2003-173973), hereinafter referred to as Manabu. Claims 10 and 16 stand rejected under 35 U.S.C. §103(a) as being obvious over Chen, et al. (Serial No. 10/178,381), hereinafter Chen '381', in view of Takahashi (U.S. Publication No. 2004/0129218). Claim 17 stands rejected under 35 U.S.C. §103(a) as being obvious over Chen, in view of Hanson, et al. (Advanced Energy: Optimizing Chemical Vapor Deposition Processing Through RF Metrology, 1999), hereinafter referred to as Hanson. Applicants respectfully traverse these rejections based on the following discussion.

The claimed invention provides a method of detecting abnormal plasma discharge in a chamber. In the rejection, the Office Action argues that Chen discloses a method of detecting plasma instability using an impedance meter, comprising gradually increasing

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the power of an input signal. However, Chen does not disclose using the impedance meter for detecting an abnormal *plasma discharge*. Moreover, Chen fails to disclose gradually increasing the power of the input signal. Therefore, as explained in further detail below, Applicants respectfully submit that the prior art of record does not teach or suggest the claimed invention.

The claimed invention discloses detecting abrupt changes in impedance to detect plasma discharge. Such features are defined in independent claims 1 and 21 using the following language: "detecting whether an abnormal plasma discharge exists in said chamber by detecting an abrupt change in said impedance"; and in independent claim 11 using the following language: "detecting whether plasma leakage exists in said chamber by detecting an abrupt drop in peak-to-peak voltage of said chamber".

The Office Action argues that Chen discloses applying an impedance meter in monitoring for agitation frequency of the instability of the RF plasma, mainly appearing in electronegative discharging having a significant effect to the instability of the plasma process (p. 0041). Contrary to the position taken in the Office Action, however, Chen only discloses using the impedance meter for detecting plasma instability. Chen does not teach using the impedance meter for detecting an *abnormal plasma discharge*.

Accordingly, Applicants submit that detecting plasma instability does not indicate an abnormal plasma discharge.

In addition, the Office Action asserts that Chen teaches an abrupt change in impedance; however, the change in impedance in Chen is due to the fact that the plasma is being pulsed, i.e., turned on and off deliberately. Therefore, the abrupt change in

impedance in Chen is not a result of an abnormal plasma discharge; the change in impedance is due to the deliberate turning on and off of the plasma. As such, changes in impedance are not monitored in Chen for detecting an abnormal plasma discharge.

The Office Action also argues that Chen discloses gradually increasing (ramping) the power of the input signal. Specifically, the Office Action asserts that "[a]lthough Chen et al. fails to clearly teach the input signal comprises a ramped signal ... Chen does succeed in teaching input power meter of pulse RF plasma with pulse frequencies between 0.0001%-100%, which clearly demonstrates the capability to be ramped." Applicants respectfully disagree with such a conclusion. There is no teaching in Chen to provide a method step of increasing, gradually or otherwise, the power of the input signal. Chen discloses modulated signals comprising square-waves (Rec), sine-waves (Sine), delta-waves (Tri), and trapezoidal-waves (Trape), whose duty cycle is between 0.0001%-100% (50% in the preferred embodiment). However, it would not have been obvious to gradually increase the power of the input signal given the duty cycle disclosed in Chen. Furthermore, Applicants submit that the duty cycle is not analogous to the power of the input signal.

Therefore, contrary to the position taken in the Office Action, Applicants submit that Chen does not teach or suggest a method of using the impedance meter for detecting an abnormal plasma discharge. Thus, it is Applicants' position that Chen does not disclose or suggest the claimed feature of "detecting whether an abnormal plasma discharge exists in said chamber by detecting an abrupt change in said impedance" as defined by independent claims 1 and 21. Further, Chen does not disclose or suggest the

claimed feature of "detecting whether plasma leakage exists in said chamber by detecting an abrupt drop in peak-to-peak voltage of said chamber" as defined by independent claim 11. In addition, it is Applicants' position that Chen does not disclose or suggest the claimed feature of "gradually increasing the power of said input signal" as defined by independent claim 11; and the claimed feature of "providing an input signal to said chamber, wherein said input signal comprises a ramped signal" as defined by independent claim 21.

Therefore, it is Applicants' position that Chen is a generalized teaching of an impedance meter that does not teach or suggest many features defined by independent claims 1, 11 and 21 and that such claims are patentable over the prior art of record. Further, it is Applicants' position that dependent claims 2-10 and 12-17 are similarly patentable, not only because of their dependency from patentable independent claims, but also because of the additional features of the invention they defined. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

## **II. Formal Matters and Conclusion**

With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims.

In view of the foregoing, Applicants submit that claims 1-17 and 21, all the claims presently pending in the application, are patentably distinct from the prior art of record

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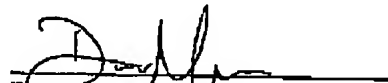
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and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0456.

Respectfully submitted,

Dated: 1/24/06

  
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